Remarks

The Examiner has rejected claims 34-37 and 46-49 under 35 U.S.C. 103(a) as being unpatentable over Jones (US 5126156) in view of Tomita et al. (US 5403611). Applicant has amended the claims to more clearly define Applicant's invention and to more particularly show the differences between Jones and Tomita. Applicant has amended independent claims 34, 46 and 59, changing the claimed ranges of the sugar content and melting temperature. The specification supports these changes. In the claims as originally filed the sugar content is as low as 6.0%. See Claim 32. Original claims 21-24 have a sugar content of 7.5%. Also, in the specification, applicant discloses a single phase product that remains a "solid up to -25°C" with a "melting point at approximately -6°C."

Examiner contends that it would have been obvious to one of ordinary skill in the art at the time of the invention was made to use an ice cream premix ... comprising 8-20% sugar ... for the ice cream product as taught by Jones and that one would have been motivated to do so since Jones teaches of making a dairy based ice cream product but does not teach a composition for doing so, and since Tomita teaches of a general dairy based composition for ice cream products. Applicant contends that the prior art references fail to teach or suggest all of the claim limitations in the amended claims. Jones fails to disclose a product that is capable of being stored at temperatures that range from -5°C to -25°C and Tomita fails to disclose an ice cream product having less than 8% sugar as claimed in the present invention.

Examiner claims that "one of ordinary skill in the art at the time the invention was made would expect the pellets as taught by Jones to maintain their individuality at a

temperature of -23°C (i.e. about -18°C and about -20°C) for at least less than 30 hours." Examiner contends that Jones reads upon the instant claims because Jones teaches a freezing temperature below the instantly claimed melting temperatures.

Applicant respectfully traverses Examiner's assertion that the pellets described in Jones maintain their individuality at a temperature of -23°C. Applicant asserts that Jones discloses a product that maintains its individuality at a temperature around -26°C up to 30 hours. Applicant directs Examiner's attention to Jones, Col 2 line 58 to Col 3 line 10. Jones discloses that the product must be stored within a freezer at a temperature of at least as low as -20°F (-29°C) and preferably between -30°F (-34°C) and -40°F (-40°C) if the product is to be stored for more than 30 hours. Jones Col 2 Line 58-62. Jones also discloses that for serving purposes, the product is to be stored at a temperature of around -15°F (-26°C) for less than 30 hours, not -23°C as Examiner contends. Nowhere in the specification does Jones disclose a product that maintains the individuality of the discrete pellets at a temperature of around -23°C.

Applicant also respectfully traverses Examiner's contention that prior art teaching a single phase product that has lower freezing temperatures than the instantly claimed temperatures reads upon the instantly claimed melting temperatures. As cited in the specification, the main object of the invention is to elevate, not lower, the melting temperature of the frozen pellet and still retain the discrete free-flowing frozen pellet. Having a single phase product with an elevated melting point expands the retail market of the traditional product outside of sporting events and amusement parks to grocery stores because expensive lower temperature freezers are not required for the elevated melting point product of the present invention. Jones discloses a product with a much lower

melting temperature than the presently claimed single phase product. The single phase product disclosed in Jones agglomerates at temperatures above -30°C. Since the prevention of agglomeration is an objective of the claimed invention, the elevated melting point property of the claimed invention is an important improvement to the prior art. The elevated melting point allows the single phase product to remain in a single phase while being stored in conventional or home freezers.

Examiner claims that "Tomita teaches that ice creams are generally ... 8-20% sugar, i.e. sucrose ... for the ice cream dessert product as taught by Jones." Applicant has amended the claims to cover a range of sugar that is not taught or suggested by the prior art. Applicant also contends that Tomita does not teach or suggest the claimed invention because Tomita is not a single phase product. Tomita discloses a soft ice cream bulk product that isn't in pellet form and not intended to be in pellet form. The soft ice cream bulk product is also a three phase product with a combination of air, liquid and solid as the final product. Nowhere in Tomita is it taught or suggested to use the composition disclosed to form a single phase product in pellet form.

The Examiner has rejected claims 38-45 and 50-79 under 35 U.S.C. 103(a) as being unpatentable over Jones (US 5126156) in view of Tomita et al. (US 5403611) further in view of the combination of Cole et al. (US 4374154) and Igoe et al. (Dictionary of Food Ingredients, 3rd Edition 1996). Applicant has amended the claims to avoid the prior art and render the claim patentable in view of the prior art.

The Examiner contends that Jones in view of Tomita teach "an ice cream product premix that contains optional stabilizers and flavoring agents." Since the references, however, are silent to the specific optional ingredients, Examiner contends that Cole

"teaches of an ice cream product with a similar composition to that as taught by Jones in view of Tomita" contains the optional stabilizers and flavoring agents described in the claims, specifically artificial sweeteners. Examiner contends that Igoe specifically discloses that the artificial sweetener, aspartame, "is used in frozen desserts."

Applicant contends that there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Jones and Tomita teach a frozen ice cream product. Cole teaches a soft product, similar to soft serve ice cream. Nowhere in Cole is a single phase product disclosed. The product described in Jones and Tomita isn't disclosed in Cole because a soft product is needed when the product is extruded from a container before being consumed. The extrusion process greatly alters the shape of the product for the purposes of appearing to be soft serve ice cream. The Jones and Tomita products does not have these characteristics. The product described in Jones is in the form of tiny pellets that are kept at low enough temperatures so that they will not combine. Since soft products will not maintain their shape and will combine with other soft products, there is no suggestion or motivation to modify or combine the reference teachings.

Applicant also contends that Cole teaches away from the claimed invention. One of the objectives of the present invention is that it will maintain its basic structural integrity and individuality at these storage temperatures. At a certain fusing temperature, the product becomes sufficiently soft so that the pellet will now stick to adjacent pellets and they will stick together. A soft product will start to agglomerate into a single mass, thereby losing its individuality. The soft product described in Cole purposely

agglomerates so that it appears as one product. Since Cole specifically teaches a product with an objective of combining into one product and the present invention's objective is to maintain individuality, Cole teaches away from the claimed invention.

The Applicant submits new claims 81-84. Claims 81-84 more clearly define the applicant's invention and more particularly show the differences between Jones in view of Tomita and in further view of Cole. The Applicant has included the limitation "a premix containing no bulking agents." Support for this limitation can be found in the specification in paragraph 0113. Nowhere in Jones, Tomita or Cole is there a teaching, suggestion or motivation to use a total sucrose or sucrose equivalent content of less than 8.5% in the absence of a bulking agent to create a single phase frozen dessert product. Thus, claims 81-84 are patentable over the prior art.

Jones, Tomita and Cole fail to teach, suggest or motivate the use of a total sugar level below 8.5% in a frozen dessert product without the use of a bulking agent as well. As the Examiner notes, Cole teaches that artificial sweeteners may be added to the frozen dessert product to adjust the sweetness of the product and reduce the amount of sugar. While the use of artificial sweeteners significantly reduces the amount of sugar used to regulate the sweetness of the frozen dessert product, bulking agents are needed to regulate the freezing point of the product. As noted in ICE CREAM, by Marshall, Goff and Hartel, it is common to substitute sweeteners derived from starch for sucrose when making ice cream. See pg. 75 of ICE CREAM. These starches, during the hydrolysis process, obtain slightly different sweetness and freezing point characteristics than sugar. This allows for the use of artificial sweeteners in conjunction with a bulking agent to simulate sugar. Since artificial sweeteners do not depress the freezing point of the

product, hydrolyzed starch with a fraction of the sweetness of regular sugar may be added as a bulking agent to replace sugar's effect on the freezing point without increasing the sweetness of the frozen dessert product. See ICE CREAM Table 2.1 for list of bulking agents used as sweeteners.

Both Cole and Tomita teach the use of other sweeteners besides sugar in a frozen dessert product. Cole teaches that "the carbohydrate constituent of [a] frozen dessert is a combination of saccharides that provide simultaneous control of freezing point depression [and] sweetness." See Cole 6.1-6.4. Cole also discloses that the term carbohydrate extends beyond simple sugars to include bulking agents such as starch hydrolyzates and non-fat milk solids. See Cole 2.28-2.29 and 5.34-5.38. Factoring in bulking agents along with the sugar content in the frozen dessert product, Cole discloses that the total carbohydrate level present in the invention is from 24-34%.

Tomita discloses a purified sugar content range of 8-20% in its frozen dessert product. See Tomita 1.50-1.60. However, one skilled in the art understands that while 8% sugar content is possible, the composition will require additional bulking agents to enable proper extrusion of the frozen dessert product thus increasing the total carbohydrate levels in the Tomita invention. Tomita supports this conclusion by using hydrolyzed starch powder, a bulking agent, in its experimentation. See Tomita 25.18-25.19 and 26.11. Example 12 discloses how the bulking agent is added along with purified sugar to increase the total sugar content of the premix. In Example 12, the purified sugar content of the premix is 9%, however, once the bulking agent is added, the total sucrose and sucrose equivalent content rises to 14%. So although Tomita claims an invention with 8%

sugar, bulking agent still must be added to increase the total sucrose equivalency content of the premix.

Cole and Tomita's disclosure of the use of bulking agents in both frozen dessert product to increase total carbohydrate content in their respective frozen dessert products fails to teach that a range of sugar content may be less than 8.5% as the claimed invention discloses. Thus, the claimed invention is not obvious in view of the cited prior art.

CONCLUSION

For the foregoing reasons, Applicant's claims are patentable over the cited prior art and the application should be in condition for allowance.

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that the foregoing Response was mailed by first class mail, postage prepaid, in an envelope addressed to the Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 this 31st day of October, 2008.

Thomas A. O'Rourke

to Brix (Sucrose Syrups)

Sugar (lb/gal)	Water[b] (lb/gal)
6.58	4.20
6.71	4.12
6.85	4.03
6.98	3.94
7.12	3.85
7.26	3.76
7.41	3.66
7.56	3.57
7.70	3.48
7.85	3.38
8.00	3.28
8.15	3.18
8.30	3.09
8.45	2.99
8.61	2.88

in the column by 0.12.
20°C) weighs 8.322 lb.

nstants of Corn Syrups

Weight (lb/gal)	Solids (lb/gal)
11.700	9.084
11.813	9.402
11.928	9.725
12.045	10.059
12.163	10.389
11.700	9.161
11.813	9.482
11.928	9.811
12.045	10.148
12.163	10.492
11.700	9.236
11.813	9.561
11.928	9.895
12.045	10.236
12.163	10.586
11.700	9.312
11.813	9.642
11.928	9.980
12.045	10.325
12.163	10.679

Corn Sweeteners

It has become common practice in the industry to substitute sweeteners derived from corn starch or other starch sources such as potato, tapioca, rice, oat or wheat for a portion or all of the sucrose. A typical sweetener blend for an ice cream mix usually includes 10–12% sucrose and 3–5% corn syrup solids (corn starch hydrolysate syrup, commonly referred to as "glucose solids", but not to be confused with glucose, the monosaccharide). The use of corn syrup solids in ice cream is generally perceived to provide enhanced smoothness by contributing to a firmer and more chewy texture, to provide better meltdown characteristics, to bring out and accentuate fruit flavors, to reduce heat shock potential which improves the shelf life of the finished product, and to provide an economical source of solids (Goff et al., 1990a,b).

Starch is a high molecular weight polymer of the monosaccharide glucose (also known commonly as dextrose), and is comprised of two fractions, amylose, a linear fraction, and amylopectin, a branched fraction. During the hydrolysis process, amylose and amylopectin are continually and systematically cleaved at the 1,4 glucosidic linkages by enzymes (randomly by alpha amylase to reduce total molecular weight, and sequentially by either glucoamylase to produce dextrose or beta amylase to produce maltose) resulting in controllable mixtures of medium (oligosaccharides) and low (dextrose, maltose, maltotriose, etc.) molecular weight units (Figure 3.3). Each bond hydrolyzed produces a free aldehyde group that has the same reducing ability as does dextrose. This makes it possible to monitor the process of hydrolysis, the extent of which is termed the dextrose equivalent or DE.

Maltodextrins are only slightly hydrolyzed; consequently they range in DE from 4 to 20 and are only slightly sweet. Maltodextrin can be used in the production of lowfat frozen desserts where it is desirable to find ingredients that contribute greatly to body in low solids formulations. There are several maltodextrin ingredients available that are specifically designed for lowfat systems. The medium molecular weight saccharides (dextrins) are effective stabilizers and slow the formation of large ice crystals, thus improving heat

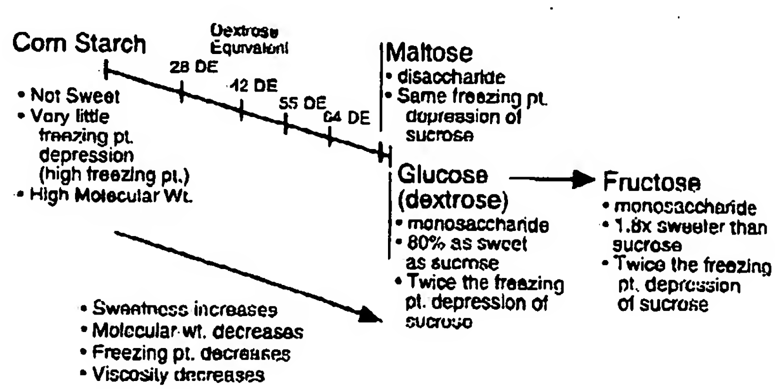

Figure 3.3. An illustration of the products that result from the hydrolysis of corn starch and their properties relevant to ice cream manufacture.

shock resistance. They also improve cohesive and adhesive textural properties, resulting in positive contributions to the body and meltdown of ice cream. The smaller molecular weight sugars provide smoothness, sweetness, and flavor enhancement. Dextrose, being a monosaccharide, causes greater freezing point depression than sucrose, maltose or lactose. With the appropriate use of enzyme technology, corn syrup manufacturers have the ability to control the ratios of high to low molecular weight components, and the ratios of maltose, the disaccharide, to dextrose, the monosaccharide. High maltose syrups reduce the effect of dextrose on freezing point.

Starch hydrolysate products having 20 to about 70% of the glucosidic linkages broken are known as corn syrups. They are classified based on degree of conversion as low conversion, 28–38 DE; regular conversion, 39–48 DE; intermediate conversion, 49–58 DE; and high conversion, 59–68 DE. The ratio of higher to lower molecular weight fractions can be estimated from the dextrose equivalent (DE) of the syrup. Figure 3.3 shows that as the DE increases, the sweetness increases but the freezing point decreases, and the contribution to viscosity and chewiness in the mouth decreases. Thus, optimization of DE and concentration of corn sweeteners are required for the most beneficial effects. These sweeteners are available in liquid (~80% solids) or dried form. Dry products are also available that have been agglomerated to produce powders with high wettability and little dust. Ice cream manufacturers usually use liquid or dry corn syrup products with a 28–42 DE.

With further enzyme processing (using glucose isomerase), dextrose can be converted to fructose (Figure 3.3), as in the production of high fructose corn sweeteners (HFCS). The resultant syrups are much sweeter than sucrose, although they have more monosaccharides and thus contribute more to freezing point depression than does sucrose. The most commonly used type is HFCS 42. It contains 42% fructose, 52% dextrose and 6% higher saccharides. HFCS 90 is a super sweet mixture of 90% fructose, 7% dextrose and 3% higher saccharides. Compared with sucrose, high fructose corn syrups (42, 55 and 90%) are from 1.8 to 1.9 times as sweet and lower the freezing point nearly twice as much (Table 2.5). Satisfactory use of HFCS requires optimization of the concentrations of all sweeteners. It has been shown that blends of high fructose syrup, high maltose syrup and low DE syrup can be utilized to provide appropriate sweetness, freezing point depression and total solids, in the absence of sucrose.

Pure crystalline glucose (dextrose) and fructose are also available from the corn sweetener industry. These are both monosaccharides and thus should not be used alone. They can be used in combination with other sweeteners to achieve the desired freezing point depression and ice cream firmness. Dextrose is a white granular material that contains approximately 99.8% sugar solids. Because it is only about 80% as sweet as sucrose, 1.25 parts of dextrose are required to replace 1 part of sucrose. Dextrose lowers the freezing point nearly twice as much as does sucrose on a weight-for-weight basis, because it has about one-half the molecular weight of sucrose.

Maple and Brown Sugars

Maple and brown sugars contain characteristic flavoring components that limit their use in ice cream. For example, only 6% of maple sugar in the mix

will produce a distinct maple f
their comparative high cost.
Both maple and brown sugar
about 86% sucrose, 10% moist
contains about 52% sucrose, 4

Honey is comprised of about
2% dextrin and 4% miscellane
provide honey flavor. Usually h
be provided by 9 kg honey
flavor may blend poorly with
to honey-flavored ice cream is

The group of mono- and di
sorbitol, mannitol, xylitol, er
related hydrogenated starch h
Dalzell (1996) and Nabors (200
low sugar or sugar free formulat
glycemic index than convention
diets of insulin-dependent, dia
agents, sweeteners, and cryst
their relative sweetness, freez
(cooling effect), stability, laxati
polyols are considered fully
Community recognizes a caloric
all polyols for labeling purposes
caloric content is permitted, a
FDA are 2.6 kcal/g for sorbitol
2.1 kcal/g for maltitol, 2 kcal/g
Sorbitol and mannitol are m
juices of apples, pears, cherries
of manna, an exudate of the a
marine algae. Sorbitol and man
glucose and fructose, respective
sweet while mannitol is 0.5× as
mannitol is not. They both pro
negative heat of solution. As n
point depression effect as sucr
recognized as safe (GRAS) in t
Canada, the European Union a
olds, in g/day, are considered to
During digestion, small am
absorbed through the wall of th
However, most of the utilization
verted to volatile fatty acids by

Table 2.1. Approximate Composition (%) of Commercial Ice Cream and Related Frozen Desserts

Product	Milkfat	Nonfat milk solids	Sweeteners[a]	Stabilizers[b] and emulsifiers	Total solids
Nonfat ice cream (hard)[c]	<0.7	12–14	18–22	1.0	35–37
Lowfat ice cream (hard)[c]	2–4	12–14	18–21	0.8	35–38
Light ice cream (hard)[c]	5–6	11–12	18–20	0.5	35–38
Reduced fat ice cream (hard)[c]	7–9	10–11	18–19	0.4	36–39
Soft serve ice cream (lowfat)	3–4	12–14	13–16	0.4	29–31
Economy ice cream	10–11	10–11	14–17	0.3	35–37
Trade brand ice cream	11–12	10–11	14–17	0.3	37–39
Deluxe ice cream	13–14	8–9	13–17	0.3	39–40
Premium ice cream	14–16	7–8	13–17	0.3	40–41
Superpremium ice cream	17–20	6–8	16–17	0.2	42–44
Frozen yogurt[d]	3.3–6	8.3–13	16–20	0.5	30–33
Lowfat frozen yogurt[d]	2–4	8.3–13	17–21	0.6	29–32
Nonfat frozen yogurt[d]	<0.7	8.3–14	17–21	0.6	28–31
Sherbet	1–3	1–3	26–35	0.5	28–36
Ice	—	—	26–35	0.5	26–35

[a]Includes sucrose, glucose, fructose, corn syrup solids, maltodextrins, polydextrose, and other bulking agents, some of which contribute little or no sweetness.
[b]Includes cellulose gum and cellulose gel.
[c]Terms for specific fat content claims are defined in 21 CFR 101.62.
[d]There are no federal standards for frozen yogurt, but they must meet the nutrition label requirements of no more than 3 g and 0.5 g of fat per serving for lowfat and nonfat types, respectively.

famous dairy cows. Mandy was a two-time All-American and three-time All-Canadian winner with records of high production of milk components. In addition to new products that can derive from changing the milk producing animal, others are likely to be based on the principle that frozen desserts can carry health-promoting constituents—the nutraceutical concept. For example, knowledge that isoflavones are healthful may cause the industry to add them as soy protein or in some concentrated form. The favorable effects of conjugated linoleic acid (CLA), omega-3 fatty acids, dietary fiber, and antioxidants on human health may prompt the increase of their concentrations in frozen desserts. Genetically engineered plants that produce flavorings are already being grown; more will be developed. They will enable more profitable production of better flavorings.

CLASSIFICATIONS OF ICE CREAM AND RELATED PRODUCTS

Classifications of ice cream and related products have been done in many different ways. Early workers (Washburn, 1910; Mortensen, 1911; Frandsen and Markham, 1915) divided them into two to ten groups, primarily depending on whether the product did or did not contain eggs. Mortensen considered commercial practices in suggesting the ten groups. Turnbow et al. (1946) defined 20 commonly agreed on terms used to categorize different frozen desserts. Table 2.2 shows widely varying standards for ice cream among major producing countries.

Table 2.2. Standards fo

Country	Milkfat (%)	N s
Australia	10[a]	
Brazil	3[b]	
Canada	10	
Greece	8	
Germany	10	
India	10	
Japan	8	
Korea	6	
New Zealand	10	
United States	10	

[a]When animal fats other than d
be declared in the ingredient li
[b]Minimum total fat is 8%.
[c]Calculated from the protein
3.5% for India. Protein was con
[d]Calculated based on minimal
nonfat solids of 1.5 g/cc, and an

Federal Standards of Ide
cream and frozen custard,
water ices in Title 21 of th
135). Additionally, regulati
pursuant to the 1993 Natior
possible the sale of an exte
less than that of ice crean
creams. To avoid conflict wi
for ice milk was revoked by
September 14, 1995. This s
containing 2–7% milkfat a
sweetened, flavored and fro
the soft-frozen and hard-fr
the new names listed abo
International Ice Cream As
Drug Administration a pr
cream. The amended stan
content of TMS and, instea
the basic mix of any product
tered milk would be allowe
ment had been met. The w
removed allowing the use
standards for ice cream w
change is that new formulat
oped forms of whey protein
tion, heat shock resistance
providing nutritional valuc
Goat's milk ice cream would